

PIEDMONT AND MOUNTAIN GLADES AND BARRENS

Concept: Piedmont and Mountain Glades and Barrens are more heavily vegetated than rock outcrop communities but are more open than the forests that typically develop with the climate and natural fire regimes of the Piedmont and Mountain regions. Some aspect of their soil or topography makes them unable to support typical forest, though they may additionally depend on fire to maintain their natural character. A variety of such factors are represented by the communities within this theme. These communities may naturally have the structure of an open woodland or savanna, or they may have a heterogeneous structure that mixes tree, shrub, and herb dominance in a fine-scale mosaic.

Distinguishing Features: Piedmont and Mountain Glades and Barrens are distinguished from forest communities by having a more open tree canopy. Tree cover probably is generally less than 50% under natural conditions. It may be denser at present in communities that depend on fire for their maintenance but almost never is a fully closed canopy. While many forests in these regions are believed to have been more open with more regular fire, the canopies of Piedmont and Mountain Glades and Barrens are more open still.

Piedmont and Mountain Glades and Barrens are distinguished from High Elevation Rock Outcrops and Low Elevation Cliffs and Rock Outcrops by having denser vegetation and more soil. Rock outcrop communities have sparse vegetation at least in the center of community patches. While individual trees in them may have significant cover, rooted plants are limited to crevices, soil mats, or similar microsites that make up a small minority of area of the community. In contrast, Piedmont and Mountain Glades and Barrens have at least shallow soil cover and rooted plants over the majority of their area. Granitic Flatrocks generally can be distinguished from Piedmont and Mountain Glades and Barrens in the same way as the Rock Outcrops. The Granitic Flatrock Border Woodland could be placed in either theme, as it is similar in structure to some Piedmont and Mountain Glades and Barrens but can be distinguished by its association with granitic flatrocks – flat or gently sloping exfoliated granite surfaces.

Synonyms:

Sites: Piedmont and Mountain Piedmont and Mountain Glades and Barrens occupy a wide variety of sites that have in common that they limit tree cover without being predominantly bare rock. Glades are communities where bedrock is near the surface, so that shallow soil limits tree cover. Communities named as woodlands are less extreme and have more tree cover, but still have cover limited by some aspect of the substrate. Some, the shale slope woodlands, have shallow soil but are also affected by slope instability. The shale breaks into flat fragments that, on steep slopes, shift readily and make rooting of plants difficult. Barrens are woodland or savanna communities that have soils that are deep but that have physical or chemical properties that are extreme and limit tree cover. Though the term “forest” is retained in the names of the Xeric Hardpan Forests, they are more truly barrens.

Soils: Soils vary drastically among the different communities in this theme. In glade communities they are shallow, with bedrock near the surface. These soils may consist of shallow mats or deep fill in crevices and are often extremely heterogeneous. In other communities, soils are deep, but

have extreme physical or chemical properties. Hardpan soils have montmorillonite as the predominant clay mineral, and their shrink-swell behavior in response to changes in water depth limits the rooting ability of woody plants. Soils derived from ultramafic rocks have unusual chemistry, with low calcium to magnesium ratios and high content of toxic metals such as nickel and chromium.

Hydrology: Hydrology varies, and moisture conditions may vary in ways that do not fit the normal moisture gradients. The shallow soils of glades dry quickly between rains and are prone to extreme drought stress. Hardpan soils can perch water on the surface, creating short-lived wet conditions, but the lack of water penetration, combined with limitations on plant rooting subjects plants to drought stress. Ultramafic rock sites may have normal moisture levels consistent with their topographic position, but consistently support vegetation suggestive of drier conditions.

Vegetation: Vegetation in Piedmont and Mountain Glades and Barrens varies greatly among the different communities. Common to all is limited tree cover, less than in typical forests, and substantial cover by herbs, or less often, low shrubs. Most trees are species shared with drier forest communities, such as *Quercus stellata*, *Quercus montana*, *Quercus marilandica*, *Pinus virginiana*, *Pinus echinata*, *Pinus rigida*, *Carya pallida*, and *Juniperus virginiana*. Shrubs vary even more, reflecting soil chemistry as well as dry conditions. Acidic communities may have beds of *Vaccinium pallidum*, *Kalmia latifolia*, or *Gaylussacia baccata*, while basic communities may have *Rhus aromatica* or an abundance of vines such as *Toxicodendron radicans*. Herb layers usually are dominated by grasses. Because of the open canopy, they contain many species intolerant of shade, while the dry site conditions also favor drought-tolerant species. Herbs common to many communities include *Schizachyrium scoparium*, *Danthonia spicata*, *Dichanthelium* spp., *Coreopsis major*, and somewhat less frequently, *Sorghastrum nutans*, *Andropogon gerardii*, and *Piptochaetium avenaceum*. Glades, especially, may contain species shared with rock outcrop communities, including *Bryodesma rupestre*, *Hypericum gentianoides*, and *Phemeranthus teretifolius*, as well as a variety of bryophytes and lichens. Basic communities contain species shared with communities with richer soils; they may even contain typical floodplain species such as *Elymus hystrix*, *Elymus virginicus*, and *Chasmanthium latifolium*. Ultramafic barrens contain particularly odd mixes of species, since their composition is determined by tolerance to unusual soil chemistry. Species such as *Podophyllum peltatum* may occur beneath drought tolerant species such as *Quercus marilandica*. Ultramafic barrens also may have narrowly endemic species, such as *Symphyotrichum rhiannon* or notable disjunct species such as *Sporobolus heterolepis*.

Dynamics: The dynamics of Piedmont and Mountain Glades and Barrens varies widely, but all of these communities represent stable open communities. While they are sometimes called “early successional,” this characterization is incorrect. They are not created by severe disturbance and are not dominated by ruderal or “pioneer” species. Under natural disturbance regimes they do not change in a directional way toward forest. Even with present-day altered disturbance regimes, where woody vegetation is denser, most do not form closed forests. In the language of succession, glades and barrens are edaphic climax communities, closely tied to distinctive environments, and generally dominated by long-lived herbaceous as well as woody species, species that do not readily colonize disturbed sites.

The relationship of Piedmont and Mountain Glades and Barrens to the prevailing regional natural disturbance regimes varies. Their fire regime may match that of the surrounding forests, through which virtually all ignition of them must have occurred. However, those with irregular vegetation, such as glades, may not carry fire well. They tend to burn in a patchy manner, with only part of the area igniting. Different patches may burn, depending on the direction of the fire's approach, but some patches may almost never burn. Fire may still be important in determining the vegetation structure of the edges and of better-connected portions, but it may have little influence on other parts.

In contrast, barrens and other communities that have more continuous vegetation may carry fire well. In these communities, fire often is important in determining their natural structure. These are places where "a little fire goes a long way." The same fire regime that prevailed in the surrounding forests can produce stronger ecological effects in barrens, leading to more open vegetation because of the more extreme environment and slower recovery of woody species. Although chronic fire would produce a more open structure than at present in the widespread forest communities, suggesting reduced contrast between them and the barrens, it may actually increase the contrast in vegetation structure.

Piedmont and Mountain Glades and Barrens may also be affected more by other natural disturbances and environmental stresses than the surrounding forests are. Shallowly rooted trees are more susceptible to blowing down in storms. Drought is more likely to kill trees with limited rooting depth. Periodic drought-caused tree mortality may be an important cause of the open structure of these communities. The author has observed numerous cases of substantial tree mortality in glades during droughts which, while fairly severe, did not kill any trees in the adjacent forest. Though less obvious, mortality of tree seedlings in drought may also contribute to openness. It may take a series of unusually moist years to allow new trees to mature in these communities. Because of these dynamics, tree stands in some glade communities may be more even-aged than typical natural forests or have most of their trees limited to a few cohorts. While the same could be true in barren communities, their more uniform vegetation and more regular exposure to prevailing fire regimes makes it more likely that they have continuous tree regeneration and uneven-aged structure similar to natural forests.

Comments: Much attention has been given to "Piedmont prairies" in the last several decades (Barden 1997). Though much of the interest in prairies was created by rediscovery of early historical writings describing large open areas, the existence of open sunny communities in the Piedmont is attested to by a substantial native flora that is now largely confined to roadsides, power line corridors, and other areas that are kept open by mowing but without soil disturbance. A large number of rare plants species with prairie affinities, either also occurring in Midwestern prairies or being closely related to species that occur there, are present in several areas in the Piedmont.

The popular concept of prairie as currently used in North Carolina, however, confounds several different kinds of vegetation, and this has led to confusion and misdirected effort. Some of it comes from states farther west, which had large prairie landscapes that did not exist in North Carolina. Some is based on the early successional vegetation in abandoned fields. The Piedmont and Mountain Glades and Barrens communities in this theme are the most natural component of the prairie concept. Though they almost certainly existed primarily as open grassy woodlands or

savannas rather than treeless grasslands in presettlement and early colonial times, they are the habitat for almost all of the rare species of prairie affinities. These species occur on roadsides almost exclusively in areas with concentrations of distinctive soils and with remnants of the natural communities in this theme. Such species have not become widespread on roadsides in other, even nearby, parts of the Piedmont.

Most of the early description of open areas cited as evidence of widespread Piedmont prairies was probably not based on Piedmont and Mountain Glades and Barrens. Early travelers generally followed existing trails and lodged in native villages, rather than sampling cross-country transects. Their observations were heavily biased toward the areas most altered by human settlement. In a rare description of a journey that was a more objective transect, the border between Virginia and North Carolina, (Byrd 1728) mentions Indians burning the woods but does not describe extensive open areas beyond immediate settlements.

Though detailed understanding of plant species composition in early accounts is generally impossible, these areas almost certainly were primarily abandoned fields, which would have been especially numerous in the years following decimation of the native population by European diseases and may not have been recognized as such by early travelers. Old field vegetation, a few years after abandonment, is dominated by *Andropogon virginicus* (Oosting 1942, Keever 1950, Schafale 1986), a species that superficially resembles the *Schizachyrium scoparium* that dominates many Piedmont and Mountain Glades and Barrens, but which has a distinctly different ecology. Most old field species have ruderal adaptations and are different species from those typical of Piedmont and Mountain Glades and Barrens. While some ruderal old field species have prospered on roadsides, the rare species and many other species associated with them on roadsides are not typical of old fields.

Though early writers sometimes enthusiastically described riding for miles through open sunny areas (e.g., Bartram 1793), it should be noted that such writings do not indicate that any kind of grassland was the predominant vegetation of the Piedmont. Their descriptions are not those of the endless prairies of the Midwest. Indeed, much of their enthusiasm seems to come from the contrast with the prevailing forest that hemmed in the rest of their journeys.

References:

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